

Application No. 08/728,027
Reply to Office Action mailed July 30, 2004

Patent
Attorney Docket No. 85773-475
(formerly 12728ROUS01U)

I. AMENDMENTS TO THE CLAIMS

Please find below a listing of claims that will replace all prior versions, and listings, of claims in the application:

Listing of claims

1. (currently amended) A protection switching arrangement for optical switching systems, comprising:
 - a plurality of optical switching matrices, each one the optical switching matrices having ~~multiple~~ a plurality of inputs and ~~multiple~~ a plurality of outputs and being ~~operable~~ operative to switch optical channel signals from any one of ~~a plurality of~~ the inputs to any one of ~~a plurality of~~ the outputs;
 - a plurality of wavelength division demultiplexers, each one of the wavelength division demultiplexers having a plurality of outputs each coupled at its outputs to one of the inputs of a respective one of the plurality of optical switching matrices, each one of the wavelength division demultiplexers having an input and being operative for dividing a composite optical signal at its input into optical channel signals and providing each optical channel signal to a ~~corresponding optical switching matrix~~ respective one of the optical switching matrices;
 - a spare wavelength division demultiplexer having a plurality of outputs each coupled at its outputs to one of the inputs of a respective one of the plurality of optical switching matrices, the spare wavelength division demultiplexer having an input and being operative for dividing a composite optical signal at its input into optical channel signals and providing each optical channel signal to a respective one of the optical switching matrices; and
 - ~~at least one~~ an optical protection switch having a plurality of inputs, ~~[[and]]~~ a plurality of straight-through outputs, and ~~at least one a~~

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protection output ~~[[and]]~~, the optical protection switch being coupled at each of its straight-through outputs to ~~[[an]]~~ the input of a respective one of the ~~plurality of~~ wavelength division demultiplexers and coupled at its protection output to ~~[[an]]~~ the input of the spare wavelength division ~~de-multiplexer~~ demultiplexer.

2. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 1xN MEMS switch where the switch matrices have N inputs.
3. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 2xN MEMS switch where the switch matrices have N inputs, and one column of mirrors in the MEMS is used for protection switching.
4. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 2xN MEMS switch where the switch matrices have N inputs, and one column of mirrors in the MEMS is used for testing.
5. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 3xN MEMS switch where the switch matrices have N inputs.
6. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 3xN MEMS switch where the switch matrices have N inputs, and one column of mirrors in the MEMS is used for protection switching.
7. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a 3xN MEMS switch where the switch matrices have N inputs, and one column of mirrors in the MEMS is used for testing.

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8. (withdrawn) A protection switching arrangement as claimed in claim 1 wherein the optical protection switch is a $3 \times N$ MEMS switch where the switch matrices have N inputs, and either of two columns of mirrors in the MEMS is used for protection switching.
9. (currently amended) A protection switching arrangement as claimed in claim 1, wherein the optical ~~channels~~ channel signals are lambdas.
10. (currently amended) A protection switching arrangement as claimed in claim 1, wherein the optical protection switch is a first optical protection switch, said protection switching arrangement further comprising a plurality of second optical protection switches corresponding to the plurality of wavelength division demultiplexers, each one of the second optical protection switches having a plurality of outputs each coupled at its outputs to one of the inputs of a respective one of the plurality of optical switching matrices and a plurality of inputs coupled at its inputs to the outputs of the corresponding a respective one of the wavelength division de-multiplexers, demultiplexers.
11. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are $1 \times M$ MEMS switches where there are M switch matrices.
12. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are $2 \times M$ MEMS switches where there are M switch matrices, and one column of mirrors in the MEMS is used for protection switching.
13. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are $2 \times M$ MEMS switches where there

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are M switch matrices, and one column of mirrors in the MEMS is used for testing the switching matrices.

14. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are 3xM MEMS switches where there are M switch matrices.
15. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are 3xM MEMS switches where there are M switch matrices, and one column of mirrors in the MEMS is used for protection switching.
16. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are 3xM MEMS switches where there are M switch matrices, and one column of mirrors in the MEMS is used for testing the switching matrices.
17. (withdrawn) A protection switching arrangement as claimed in claim 10 wherein the optical protection switches are 3xM MEMS switches where there are M switch matrices, and either of two columns of mirrors in the MEMS is used for protection switching.
18. (currently amended) A protection switching arrangement as claimed in claim 10, wherein the optical channels channel signals are lambdas.
19. (withdrawn) A protection switching arrangement comprising:
 - a first logical layer for switching optical channels;
 - a second logical layer for switching a group of optical channels; and
 - a first coupler for grouping together optical channels of the first logical layer and coupling them to the second logical layer;

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- a second coupler for ungrouping grouped optical channels of the second logical layer and coupling them to the first logical layer; and
 - a first protection switch providing an alternative switch path for at least one of the grouped optical channels from the first logical layer in the second logical layer.
20. (withdrawn) A protection arrangement as claimed in claim 19 further comprising a second protection switch providing an alternative switch path for at least one of the optical channels from the second logical layer in the first logical layer.
21. (withdrawn) A protection switching arrangement for optical switching systems comprising an optical protection switch including:
- a first column of deployable mirrors, each mirror operable for deflecting an optical signal from an optical signal input path to a protection path; and
 - a second column of deployable mirrors, each mirror operable for deflecting an optical test signal from an optical test signal input path to an optical switch testing path;
- wherein for each mirror of the first column and corresponding mirror of the second column, the respective optical signal input path and optical switch test path are substantially aligned.
22. (withdrawn) A protection arrangement as claimed in claim 21 wherein the first and second columns of mirrors are formed as faces of a deployable prism.
23. (withdrawn) A protection switching arrangement for optical switching systems comprising an optical protection switch including:
- a first column of deployable mirrors, each mirror operable for deflecting an optical signal from an optical signal input path to a protection path;

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- a second column of deployable mirrors, each mirror operable for deflecting an optical test signal from an optical test signal input path to an optical switch testing path; and
- a third column of deployable mirrors, each mirror operable for deflecting an optical signal from an optical signal input path to a protection path;

wherein for each mirror of the first and third column and corresponding mirror of the second column, the respective optical signal input path and optical switch test path are substantially aligned.

24. (withdrawn) A protection arrangement as claimed in claim 23 wherein the first and second columns of mirrors are formed as faces of a deployable prism.
25. (cancelled)
26. (currently amended) ~~[[The]]~~ A protection switching arrangement ~~[[of]]~~ as claimed in claim [[25]] 1, wherein the ~~[[first]]~~ optical protection switch is operable operative to couple an input one of its inputs associated with a faulty ~~[[input]]~~ one of the wavelength division demultiplexers to the spare ~~its~~ protection output to enable the spare wavelength division demultiplexer to serve as a backup for the faulty ~~[[input]]~~ one of the wavelength division demultiplexers.
27. (cancelled)
28. (cancelled)
29. (currently amended) ~~[[The]]~~ A protection switching arrangement ~~[[of]]~~ as claimed in claim [[28]] 10, further comprising ~~a plurality of optical switching matrices, each said optical switching matrix having a plurality of inputs and a plurality of outputs, at least one of said optical switching matrices forming a~~

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spare optical switching matrix having a plurality of inputs and a plurality of outputs and being operative to switch optical channel signals from any one of its inputs to any one of its outputs, each one of the second optical protection switches having a spare output coupled to one of the inputs of the spare optical switching matrix.

30. (cancelled)

31. (cancelled)

32. (currently amended) [[The]] A protection switching arrangement [[of]] as claimed in claim 29, wherein each one of the second optical protection switches are operable is operative to couple an input one of its inputs associated with a faulty one of the optical switching [[matrix]] matrices to an output associated with the spare optical switching matrix its spare output to enable the spare optical switching matrix to serve as a backup for the faulty one of the optical switching [[matrix]] matrices.

33. (currently amended) [[The]] A protection switching arrangement [[of]] as claimed in claim 29, further comprising a plurality of third optical protection switches and a plurality of wavelength division multiplexers, having inputs connected to the outputs of the optical switching matrices, each one of the wavelength division multiplexers having a plurality of inputs, each one of the third optical protection switches having a plurality of inputs each coupled to one of the outputs of a respective one of the optical switching matrices and a plurality of outputs coupled to the inputs of a respective one of the wavelength division multiplexers.

34.- 37. (cancelled)

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38. (new) A protection switching arrangement as claimed in claim 1, wherein, for each one of the optical switching matrices, the plurality of inputs is a plurality of first inputs and the plurality of outputs is a plurality of first outputs, each one of the optical switching matrices having a second input and a second output, said protection switching arrangement further comprising a wavelength converting switch having:
- a plurality of outputs each coupled to the second input of a respective one of the optical switching matrices; and
 - a plurality of inputs each coupled to the second output of a respective one of the optical switching matrices.
39. (new) A protection switching arrangement as claimed in claim 10, wherein, for each one of the optical switching matrices, the plurality of inputs is a plurality of first inputs and the plurality of outputs is a plurality of first outputs, each one of the optical switching matrices having a second input and a second output, said protection switching arrangement further comprising a wavelength converting switch having:
- a plurality of outputs each coupled to the second input of a respective one of the optical switching matrices; and
 - a plurality of inputs each coupled to the second output of a respective one of the optical switching matrices.
40. (new) A protection switching arrangement as claimed in claim 29, wherein, for each one of the optical switching matrices, the plurality of inputs is a plurality of first inputs and the plurality of outputs is a plurality of first outputs, each one of the optical switching matrices having a second input and a second output, said protection switching arrangement further comprising a wavelength converting switch having:
- a plurality of outputs each coupled to the second input of a respective one of the optical switching matrices; and

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- a plurality of inputs each coupled to the second output of a respective one of the optical switching matrices.